REMARKS

Reconsideration and allowance are respectfully requested. Claims 1-4, 6 and 7 are currently pending, with Claims 1 and 7 being independent. Claims 1-7 were rejected. In response, Claims 1, 4, 6 and 7 have been amended, while Claim 5 has been cancelled. No new matter has been entered. Based on the following remarks, it is believed that all pending claims are in condition for allowance and a notice to that affect is respectfully requested.

It is noted that the Examiner did not acknowledge in the outstanding Office Action the claim of priority based on Great Britain Serial No. 0310061.7 filed on May 1, 2003, or the receipt of the certified copy of the priority document filed with the USPTO on January 30, 2004. Acknowledgement of the above in the next written communication is accordingly requested.

I.   Objection to the claims

Claims 4 and 7 were objected to for a spelling informality. In response, Claim 4 has been amended to recite "center" instead of "centre". Applicant's representative notes that Claim 7 does not contain the term "centre", and as such, assumes that no such correction is required.

Claim 7 was also objected to for a typographical error. In response, Claim 7 has been amended to call for "symmetrically opposed pixels" instead of "symmetrically app pixels".

II.   Rejection based on Dougall

Claims 1-7 were rejected under 35 U.S.C. §102(b) as being unpatentable over U.S. Patent No. 5,019,903 to Dougall et al. Based on the following remarks, Applicant respectfully traverses this rejection.

Independent Claim 1 has been amended to incorporate the subject matter of dependent Claim 5, which has now been

cancelled. As amended, Claim 1 calls for a method of deriving a progressive scan image from an interlaced image, in which for each pixel to be inserted in a field from the interlaced image, the method performs the steps of:

> deriving a difference value from each pair of a set of pairs of symmetrically opposed pixels with respect to the pixel and from adjacent lines to the pixel to be inserted;
>
> determining which pair of pixels has the lowest difference value associated with it; and
>
> selecting as the value of the pixel to be inserted, the average of the pair of pixels which has the lowest difference value;
>
> wherein the step of selecting the value of the pixel to be inserted includes <u>comparing the average value of the pair of pixels with the lowest difference value with a range of values defined by the values of the pixels above and below the pixel to be inserted</u>, and <u>clamping the value of the pixel to be inserted to a point in the range in dependence on the result of the comparison</u>

(emphasis added).

In contrast to the method of amended Claim 1, the reference of Dougall neither discloses nor suggests a method of deriving a progressive scan image from an interlaced image, wherein the pair of pixels having the lowest difference value is first determined, the average value of this pair of pixels is calculated, and then this average value is <u>compared "with a range of values defined by the values of the pixels above and below the pixel to be inserted, and clamping the value of the pixel to be inserted to a point in the range in dependence on the result of the comparison"</u>.

Instead, Dougall discloses a more traditional method of interpolating a line of pixels between two successive lines of a field. As illustrated in Figure 4 of Dougall, a "gradient

vector is measured in several different locations, each
passing through the location of the pixel to be interpolated".
The measured gradient vector that "gives rise to the minimum
absolute difference in pixel luminance values is then selected
as that appropriate to employ for interpolation of the pixel
in question". (See Dougall, 4:12-29)   As Dougall further
emphasizes, blocks of pixels are subjected to a matching
operation, where the absolute difference between the related
samples of two blocks are calculated.   The average difference
values are then normalized to produce a normalized absolute
difference (NAD).   The gradient vector associated with the
shift producing the smallest average NAD is then selected as
being the appropriate one to use for the current interpolated
sample position.   (See Dougall, 7:32-57)   <u>Dougall's process of
interpolating a pixel is essentially complete once the
gradient vector associated with the smallest normalized
absolute difference is determined.   Dougall neither compares
the gradient vector having the smallest NAD value "with a
range of values defined by the values of the pixels above and
below the pixel to be inserted", nor "clamp[s] the value of
the pixel to be inserted to a point in the range in dependence
on the result of the comparison"</u>.

In contrast, the Claim 1 calls for a method whereby the
selected values that are to be inserted at a particular pixel
are clamped to be within a range defined by the value of the
pixels above and below the pixel to be inserted.   This feature
addresses anomalies that can arise using more traditional
pixel interpolation methods such as that described in Dougall.
Specifically, it is possible for the selected interpolated
pixel to fall outside the range defined in Claim 1.   If this
is the case, then it is likely that the interpolated pixel
will have been interpolated from data which is not related to
the object that is to be shown at the area where the pixel is
to be inserted.   The claimed invention overcomes this problem

by the clamping of a pixel value to the range defined by the pixels above and below the pixel that is to be inserted, and as a result, removes any unsightly artifacts that might otherwise arise in more traditional systems such as Dougall due to the result of an incorrect interpolation.

For the above reasons, Applicant believes that independent Claim 1, along with dependent Claims 2-4 and 6, are allowable over the references of Dougall. For similar reasons, Applicant believes that independent Claim 7, which is an apparatus claim corresponding to method Claim 1, is also allowable over the reference of Dougall.

III. Rejection based on Yamashita

Claims 1-7 were rejected under 35 U.S.C. §102(b) as being unpatentable over U.S. Patent No. 5,347,509 to Yamashita et al. Based on the following remarks, Applicant respectfully traverses this rejection.

Yamashita discloses an interpolation apparatus for preventing image deterioration caused by correlation errors. Specifically, Yamashita discloses a conventional interpolation scheme similar to Dougall, whereby the level difference of the various pixels located above (e.g., locations An, An+1 and An-1) and below (Cn, Cn+1 and Cn-1) the interpolated pixel are compared to determine the best interpolation line. Then the average value of the pixels on the scan lines above and below the interpolation pixel line are obtained for the selected interpolation line and output as the interpolated value. (See Yamashita, 2:1-27)

However, similar to Dougall, the reference of Yamashita neither discloses nor suggests then "comparing the average value of the pair of pixels with the lowest difference value with a range of values defined by the values of the pixels above and below the pixel to be inserted". Additionally, Yamashita does not disclose then "clamping the value of the

pixel to be inserted to a point in the range in dependence on the result of the comparison".

In contrast, Claims 1 and 7 generally call for a method and apparatus, respectively, whereby the selected values that are to be inserted at a particular pixel are clamped to be within a range defined by the value of the pixels above and below the pixel to be inserted.

For the above reasons, Applicant believes that independent Claims 1 and 7, along with their dependent Claims 2-4 and 6, are allowable over the references of Yamashita.

IV. Rejection based on Hong

Claims 1-7 were rejected under 35 U.S.C. §102(b) as being unpatentable over U.S. Patent No. 5,708,474 to Hong. Based on the following remarks, Applicant respectfully traverses this rejection.

Hong discloses a method and apparatus for interpolating a scanning line of a TV signal. In a process similar to Dougall and Yamashita, Hong detects the "discriminated variations of a video signal in the horizontal, vertical and diagonal directions. In accordance with the discriminated result, a vertical component signal and a signal of the smallest variation are multiplied by a weight and a complement to the weight, respectively. The multiplied signals are then added, and the added signal is selected as an interpolation signal for doubling the number of scanning lines of a received video signal". (See Hong, 6:1-9) Hong interpolation process is complete once these multiplied signals are added and selected as the interpolation signal.

Similar to Dougall and Yamashita, the reference of Hong conducts no form of comparing its selected value with any type of range of values based on the pixels above and below the interpolated pixel. Specifically, Hong neither discloses nor suggests "comparing the average value of the pair of pixels

with the lowest difference value <u>with a range of values</u> <u>defined by the values of the pixels above and below the pixel</u> <u>to be inserted</u>". Nor does Hong disclose "<u>clamping the value</u> <u>of the pixel to be inserted to a point in the range in</u> <u>dependence on the result of the comparison</u>".
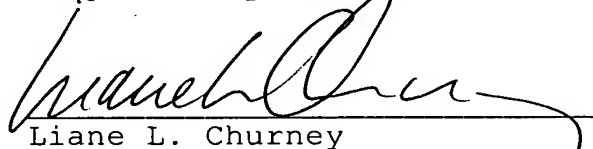
In contrast, Claims 1 and 7 generally call for a method and apparatus, respectively, whereby the selected values that are to be inserted at a particular pixel are clamped to be within a range defined by the value of the pixels above and below the pixel to be inserted.

For the above reasons, Applicant believes that independent Claims 1 and 7, along with their dependent Claims 2-4 and 6, are allowable over the references of Hong.

V.   Conclusion

All objections and rejections having been addressed, it is respectfully submitted that the present application is in condition for allowance, and a Notice to that effect is earnestly solicited.

Respectfully submitted,

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